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Federal-State Cooperative
Snow Surveys and Water Supply Forecasts
for

ARIZONA

CURPE T SECIAL RECORD

CCASTS

MAR 2 9 1955

SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Data included in this report were obtained by the agency named above in cooperation with the Federal, State and local organizations listed on the last page of this report.

__ AS OF___

FEBRUARY 15, 1955

UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE

TO RECIPIENTS OF COOPERATIVE SNOW SURVEY AND WATER SUPPLY FORECAST REPORTS:

Forecasts by U. S. Weather Bureau of total annual streamflow October-September, inclusive, at more than 300 gaging stations are issued monthly January through May in the publication WATER SUPPLY FORECASTS FOR THE WESTERN UNITED STATES.

Weather Bureau forecasts of runoff presented in that bulletin are computed from procedures based on mathematical analysis of the relation between precipitation and runoff.

The Weather Bureau bulletins may be secured by writing to:

Hydrologist in Charge River Forecast Center U. S. Weather Bureau 712 Federal Office Building Kansas City 6, Missouri

For current information on local river and flood conditions, reference should be made to the appropriate River District Office, listed below:

Meteorologist in Charge......Colorado River and Weather Bureau Airport Station tributaries in Arizona 3000 Sky Harbor Blvd., except San Juan Phoenix, Arizona

State of Arizona

COOPERATIVE SNOW SURVEYS and WATER SUPPLY FORECASTS

for

ARIZONA

(Salt, Verde, Gila and part of Lower Colorado River Basin)

Issued

February 15, 1955

Report Prepared

Вy

W. E. Anderson, Snow Survey Leader

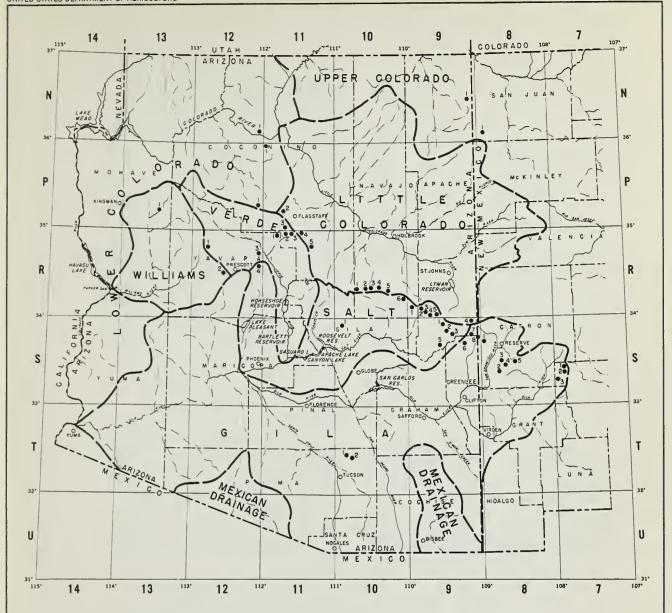
Salt River Valey Water Users' Association and Soil Conservation Service Main Post Office Bldg. Phoenix, Arizona

Issued By

Robert V. Boyle State Conservationist

Victor I. Corbell President Soil Conservation Service Salt River Valley Water Users' Assn.

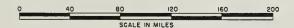




DRAINAGE BASIN BOUNDARY 13 SNOW COURSE

ARIZONA COOPERATIVE SNOW SURVEYS

SNOW COURSES AND DRAINAGE BASINS
JANUARY 1955



NUMBER	NAME	SEC	TWP	RGE** E	LEVATION	RIVER BASIN
11-P-3	Antelope Park	29	19N	8E	7300	Verde Discontinued
9-S-1	Baldy	28	7N	27E	9000	Salt-Little Colorado
10-T-1	Bear Wallow	6	125	16E	8100	Gila
9-5-6	Begver Head	13	4N	30E	8000	Salt-Frisco
9-5-3	Big Lake Knoll	2	5N	28E	8800	Salt-Frisco-Little Colorado Discontinued
, ,	0.9 22	_	• • •			
7-S-3	Black Canyon	8	135	11W***	6790	Gila
12-N-1	Bright Angel	34	33 N	3E	8400	Lower Colorado
12-R-1	Camp Wood	3	16N	6W	5700	Williams-Verde
10-R-3	Canyon Creek (s)	18	11N	15E	7500	Salt
11-R-2	Casner Park (s)	19	18N	8E	6950	Verde
12-P-1	Chalender (s)	27	22N	3E	7100	Verde
8-5-3	Corner Mountain	7	105	17W***	8850	Gila-Frisco
9-S-7	Coronado Trail	26	5N	30E	8000	Salt-Frisco
10-R-2	Elk	31	11N	14E	7600	Salt-Little Colorado Discontinued
10 - R-6	Forest Dale (s)	2	9N	21 E	6000	Salt-Little Colorado
	- 11 -					
12-R-4	Gaddes Canyon	11	15N	2E	7600	Verde #
10-R-5	Gentry	36	11N	15E	7600	Salt-Little Colorado
11-P-2	Fort Valley	22	22N	6E	7350	Verde #
9-R-5	Ft. Apache	18	7N	27E	9160	Salt-Little Colorado
8-S - 1	Frisco Divide	31	6S	20W***	8000	Frisco-Gila
11 D 1	Cuand Canada	21	2011	45	7500	Lawren Calanada
11-P-1	Grand Canyon	21 30	30N 17N	4E 9E	7500 7630	Lower Colorado Verde
11-R-5 10-R-4	Happy Jack Heber	28				Salt-Little Colorado
7-S-2	Inman	6	11N 11S	15E 10W***	7600 7800	Gila
12-R-2	Iron Springs	22	14N	3W	6200	Williams-Verde
12-11-2	non springs	22	1414	344	0200	Williams-Verde
9-S-2	Maverick Fork (s)	13	6N	27E	9050	Salt-Little Colorado
9-R-4	McKay Peak	13	7N	24E	8250	Salt Not read
9-R-2	McNary (s)	14	8N	23E	7200	Salt-Little Colorado
9-R-1	Milk Ranch	28	8N	23E	7000	Salt
12-R-3	Mingus Mountain	3	15N	2E	7100	Verde #
8-S-2	Mogollon	2	115	19W***	7000	Frisco-Gila
11-R-4	Mormon Lake	13	18N	8E	7350	Verde #
11-R-3	Mormon Mountain(s)		18N	8E	7500	Verde
11-R-1	Munds Park (s)	7	18N	7E	6500	Verde
8-5-4	N -B ar Lake	16	105	17W***	8600	Gila
0.5.5	M	,	100	T ()) () below	0000	0:1
8-S-5	Negrito	6	105	16W***	8200	Gila
9-S-4 9-S-5	Nutrioso	23	6N	30E	8500	Salt-Frisco-Little Colorado
9-S-5	Pacheta			verick, Ariz 6W****		Salt Little Colorado # Not read
9-N-1 10-T-2	Roof Butte Rose Canyon	15 15	8N 12S	16E	8500 7300	Gila Not read
10-1-2	rose Canyon	13	123	IOE	/300	Gild
9-S-8	State Line	6	65	21W***	8000	Gila-Frisco
7-S-1	Taylor Creek	20	105	10W***	7850	Gila
9-R-3	Trout Creek	5	7N	24E	6400	Salt Not read
8-N-1	Washington Pass Lat					Little Colorado # Not read
13-P-1	Willow Ranch	16	21N	11W	5000	Williams
10-R-1	Woods Canyon	15	11N	13E	7640	Salt-Little Colorado Discontinued
10-S-1	Workman Creek	33	6N	14E	6900	Salt

^{*} Number indicates location of course within coordinate rectangle, thus 9-N-1 is Course #1 in coordinate rectangle 9-N.

^{**} All in Gila and Salt River Base and Meridian except where otherwise indicated.

^{***} New Mexico Principal Meridian.

^{****} Navajo Base.

^{*} On adjacent drainage.

⁽s) Soil Moisture Station installed on or in vicinity of course.

[§] Unsurveyed.

WATER SUPPLY OUTLOOK

ARIZONA

FEBRUARY 15, 1955

GENERAL

Physical condition of the snow has improved considerably since the last report. Several warm days permitted a crust to develop, and snow density has also increased. This has reduced the rate of evaporative losses somewhat, but many courses have experienced a rapid depletion of the pack, with no indication from soil measuring units that the soil moisture content has been significantly increased. Present snow water content is substantially below average for all watersheds except in the general vicinity of Flagstaff.

Long range weather forecasts are for cooler weather with above normal precipitation. Precipitation much above normal for the next six weeks will be required to bring the water supply outlook up to anything resembling normal. Unless such above normal precipitation does occur, the water users will realize little or nothing from the existing snow pack.

No water is running off at present. The extensive areas of bare ground are dry and barely surrounded by thin borders of wet soil where the edges of the snow banks are melting. All the water is soaking in or evaporating, and the amount that has been available to infiltrate into the ground has not been nearly enough to saturate the soil. Even if additional snow is received, it can be expected that substantial amounts of the water from it will be intercepted by the dry soils and only a small portion will remain to produce runoff.



SNOW COVER AND WATERSHED CONDITIONS

Verde River Basin

Snow cover on the Verde drainage is generally better than on any of the rest of the Arizona drainage areas. Many of the courses are well above average, and the snow density is higher than on the rest of the state.

Sixteen fibre glass soil moisture units have been installed at four locations on this drainage, but the period of record does not permit correlative or comparative use of the data as yet. However, from field calibration of the resistance valves, it appears that the soil is generally dry down to or near the wilting point on all areas and it can accordingly be concluded that the amount of water in the present snow pack is insufficient to make up the soil moisture deficiency. The only exception is reflected by the Soil Moisture Station at Munds Park, where the soil has been saturated to approximate field holding capacity to below four feet. This station is situated in an exposed location, and the conditions reflected undoubtedly represent characteristics of its site. At the nearby Casner Park Station, no comparable soil moisture conditions are noted.

Plans are being laid to include information from the Soil Moisture Units in these bulletins when sufficient data has been accumulated over several years time to permit comparative use of it.

Precipitation on the Verde continues generally below normal. Some areas of above normal precipitation have occurred, generally at lower elevations. There has been no precipitation since the last report. Stream flow has been below average reflecting the accumulated deficiency in precipitation and the generally cold weather. Reservoir storage is slightly above the 10-year average for this date, but only 19% of capacity. There is little probability that the reservoirs will fill this year.

Storage in Lake Mary is at a very low level, as is Mormon Lake. Present indications are that below normal runoff will occur in this vicinity and that there is little probability of substantial gains in these lakes. Horseshoe reservoir on the Verde contains only 2,000 acre feet at this time, and it would appear that the Salt River Valley Water Users and the City of Phoenix can not expect to build up much of a reserve water supply in this reservoir this year unless weather conditions more favorable for snow and runoff production occur soon.



Salt and Tonto River Basin

Snow cover on the Mogollon Rim and White Mountain country ranges from near average on the lower elevations to substantially below average on the higher courses. Snow density has increased during the past two weeks and, as on the Verdebasin, a crust has formed that is helping to preserve the water content.

Water content of the snow pack has decreased an average of 1/2-inch since the last report, and is generally about 1/2-inch or 10% below normal for this date. Deficiencies in the higher water producing areas, however, are greater than this and portend a severe shortage of runoff in this basin also.

A network of soil moisture measuring units has also been installed on this basin, permitting more accurate field observation of soil moisture conditions. Readings made on February 15th indicate that nowhere has the moisture penetrated deeper than one foot and in all locations the increase in soil moisture content is very small. In only one instance, at Corduroy Creek near Forest Dale, did the meter show a measurable increase at the one foot depth and at this location the moisture content was still but little above the wilt point.

Streamflow has continued deficient on this basin also. Runoff rates on the Tonto indicate the probability that practically all of the water is base flow and reflects conditions
which do not hold out promise of much increase. The Salt has
been at extremely low stages rather consistently for the fall
and winter months. These deficient flows reflect directly the
below-normal precipitation that has occurred over the past several years. Recent above-normal precipitation in the Flagstaff
and lower areas of the state have not resulted in any improvement in conditions on the Salt River Drainage basin.

Water in storage in the Salt River system is sufficient to provide for most of the irrigation requirements for the ensuing season and is slightly above average for this time of year. However, it is only approximately 47% of capacity and there appears little chance that the reservoirs will fill this season.

Gila and Frisco River Basins

Snow cover on the Gila-Frisco basin is substantially below normal. In the White Mountain and upper Frisco area, there is some now in the higher elevations, but the areas at these elevations is small and produces only limited volumes of water. The snow cover on the main Gila basin is very limited and all courses are bare.



Additional snow courses were located this year in the higher elevations of the middle fork country in order to obtain a more complete picture of snow conditions on the interior of the basin, but operational difficulties have prevented these courses from being put into use. It is hoped they can be put into use next year.

Deficient precipitation has left the soil generally dry, but melting of early season snows has helped to soak up the soil. This accumulation of moisture, however, while beneficial to the range plants, has not been sufficient to saturate the soil to any great depth and provide water for runoff.

A general exception to the Gila River Basin as a whole is in the Santa Catalina Mountains, where conditions at Rose Canyon and Bear Wallow are substantially above those of recent years. Water supplies in these mountains should be considerably better this year, both in the springs and in the form of runoff. However, these mountains are in the lower part of the drainage area and contribute no water to surface reservoirs or irrigation systems.

Storage in San Carlos reservoir is 26% of the 10-year average and only a small fraction of capacity. There does not appear to be any possibility of substantial increases in the amount currently in storage unless unusual storms occur.

Other Basins

Comparable conditions to those described above exist on all other basins in the state. A notable condition is at Bright Angel course where water contents are only 55% of normal. The course at Grand Canyon, at a lower elevation on the south rim, is near average for this time of year.

The Bill Williams River basin, with an early snow pack of much above normal -- heaviest of any Arizona drainage basin early in the season -- has dropped off to where conditions are about average. The loss of snow water on the Iron Springs course has been 3.7 inches in the last two weeks, an extremely high rate for this season. We have no information as to soil moisture conditions in this basin, but they should be better than for recent years with snow pack ablation at this rate.

The Little Colorado River basin includes area contiguous to the Verde, Tonto, Salt and Frisco drainages, and its headwaters include conditions described for those basins. For the basin above Lyman Dam, the prospects are rather poor, being for only 16% of the 10-year average. With a low carry-over storage in Lyman Reservoir, the prospects are for a deficient supply for water users on this project.



STREAM FLOW FORECASTS FEBRUARY 15, 1955

The following summarized runoff forecasts are based principally on mountain snow cover and on the assumption that precipitation and temperature during the forecast period will be near average. Appreciable deviations from normal of temperature and/or precipitation during the forecast period will correspondingly modify these forecasts.

Basin, Stream		-	low in Th February		of Acre Ft.
and	Forecast	%			10 - Yr.
Station		10-Yr.	Measured	Runoff	
	1955	Ave.	1954	1953	

Salt River at intake	70	26	224.2	140.5	269.4
Tonto River above Roosevelt	10	26	30.3	27.0	38.5
Verde River above Horseshoe	63	34	178	53.2	185.9
Gila River at Virden	16	36	243	25.9	44.4
Frisco River at Clifton	11	30	30.1	16.5	37.3
Little Colorado River above Lyman Dam	1.3	16	#	2.1	8.3*

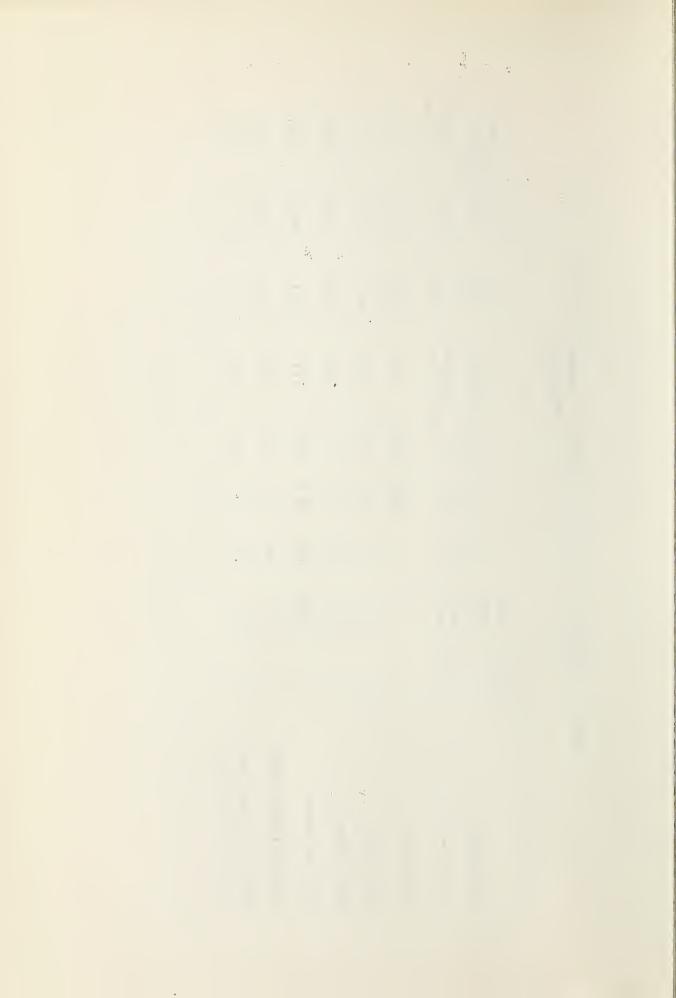
^{*} Forecast period for Little Colorado River above Lyman Dam is for February - June, inclusive.

[#] Not available



SUMMARY OF FEBRUARY 15, 1955 SNOW SURVEYS AND COMPARISON OF DATA WITH THAT OF REVIOUS YEARS BY WATERSHEDS

	No. of Courses	Snow	Snow V	later Co	ntent	Snow Water Content in Inohes	Snow	1955 Water Content in percent of	. Content
WATERSHEDS	in Average	1954 Inches	1955	1954	1953	Average	1955	1954	Average
Gila River	ω	4.8	1,2	0,3	0.4	1.9	25.0	400	63
Salt River	14	10.8	3.1	2,0	1.9	3.4	28.7	155	. 61
Verde River	6	11.0	8.3	1,9	6°0	2,7	30.0	173	122
Williams River	ю	9.2	9°0	0.1	0.0	1,01	23,1	009	55
Lower Colorado River	4	15.2	3.6	9°8	2,2	4°4	23,7	138	82
Little Colorado River	O	10.4	3,2	2.0	6.0	3.0	30.8	160	107



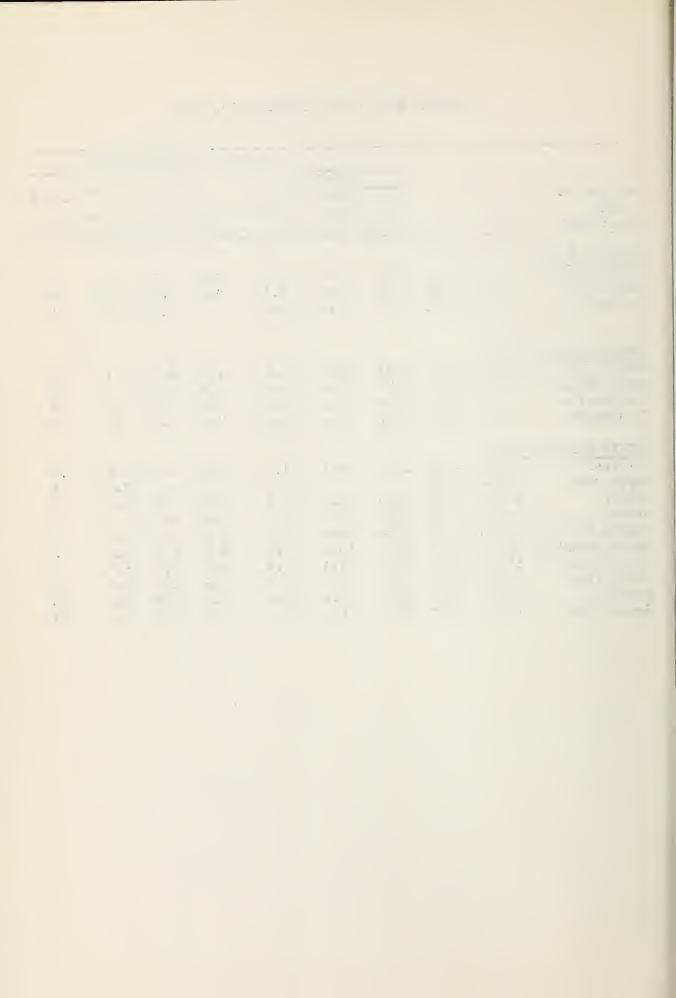
					SNOW C	OVER M	EASURE	MENTS	
				1955			PAST	RECORD	
DRAINAGE BASIN and SNOW COURSE	No •	E lev e	Date of Survey	Snow Depth	Water Content (in.)	Water 1954	Conte	nt (in.) Average	Years of Record
GILA RIVER Nutrioso Pear Wallow* Frisco Divide State Line Coronado Trail Beaver Head Taylor Creek Inman Rose Canyon	9-S-4 10-T-1 8-S-1 9-S-8 9-S-7 9-S-6 7-S-1 7-S-2 10-T-2	8100 8000 8000 8000 7850 7800 7300	2/15	6.1 15.4 7.7 9.9 8.4 6.3 0.0 0.0	1.7 4.8 1.8 2.1 2.5 1.4 0.0 0.0	0.2 1.9 0.4 0.4 0.2 0.3	0.3 0.0 0.8 0.4 0.3 1.3 0.0 0.0	2.2 2.1 1.9 2.6 3.4 3.0 0.7 0.8 1.0	15 7 15 15 15 15 15 17
Mogollon Black Canyon	8-S-2 7-S-3	7000 6790	2/15	0.0	0.0	0.8 0.4	1.8	1.3 0.4	2 2
SALT RIVER Ft. Apache** Baldy** Maverick Fork Nutrioso Coronado Trail Beaver Head Pacheta Gentry Heber Canyon Creek McNary Milk Ranch Workman Creek Forest Dale	9-R-5 9-S-1 9-S-2 9-S-4 9-S-7 9-S-6 9-S-5 10-R-5 10-R-3 9-R-2 9-R-1 10-S-1 10-R-6	9125 9020 8500 8000 7800 7600 7500 7200 7000	2/15 2/15 2/15 2/15 2/15 2/14 2/14 2/14	17.9 16.8 18.6 6.1 8.4 6.3 12.5 8.3 10.0 12.0 9.6 5.6 13.4 5.5	4.5 4.3 5.0 1.7 2.5 1.4 2.9 3.1 3.4 3.9 2.4 2.1 4.9 2.0	5.3 4.9 5.0 0.2 0.3 0.5 2.0 1.8 2.2 2.9 0.0 2.4	6.3 5.3 4.2 0.3 0.3 1.3 - 0.4 0.9 0.9 0.6 0.1 5.7 0.0	6.2 8.8 7.0 2.2 3.4 3.0 1.7 2.3 2.3 3.1 2.5 1.3 3.1	5 5 5 15 15 5 5 5 15 14 3 15
VERDE RIVER Happy Jack Gaddes Canyon* Mormon Mountain Mormon Lake** Fort Valley** Mingus Mountain Chalender Casner Park Munds Park Iron Springs** Camp Wood	11-R-4 11-P-2	7500 7350 7350 7100 7100 6930 6500 6200	2/14 2/16 2/14 2/15 2/14 2/15 2/16 2/14 2/15	16.6 16.6 17.4 8.1 5.9 16.4 15.0 12.0 2.6 5.2	4.4 5.0 5.3 2.3 1.8 4.4 5.0 4.1 0.8 1.1	2.6 3.8 3.0 1.8 1.2 2.6 2.3 2.4 0.0 0.3	2.9 1.5 1.0 0.0 1.1	2.6 - 4.5 5.7 3.0 1.6 3.5 2.8 0.6 1.5 1.0	4 1 5 8 8 8 8 5 9

^{*} Not included in averages
** On adjacent drainage

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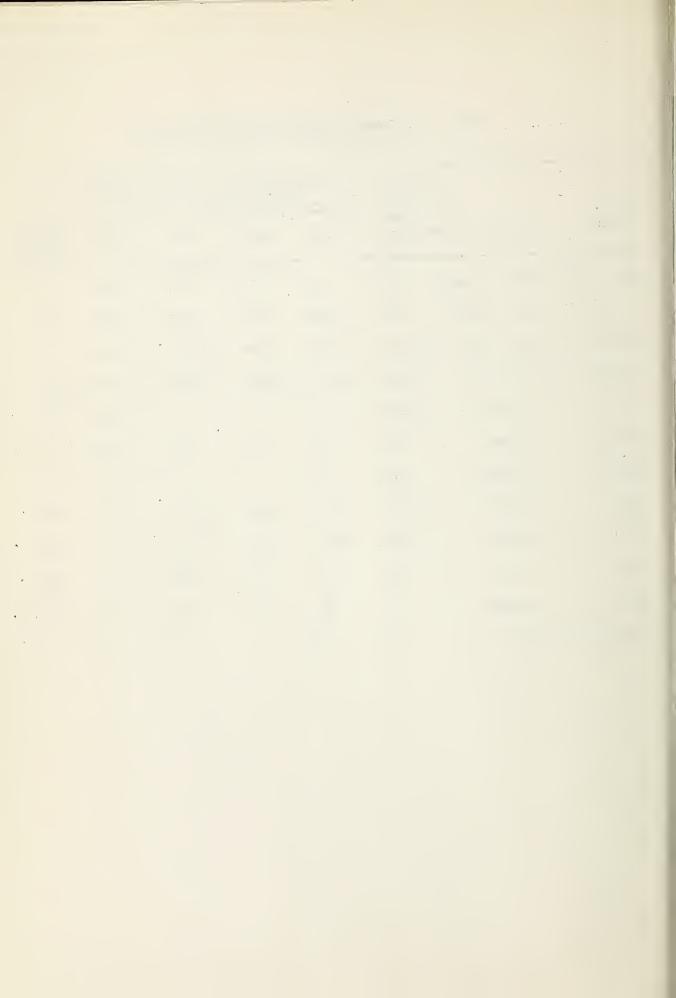
ARIZONA SNOW SURVEY FEBRUARY 15, 1955

					SNOW	COVER	MEASI	PEMENTS	
				1955			FAST 3		
DRAINAGE BASIN			Date	Snew	Writer		N		Years
and				Depth	Content			nt (in.)	c.e
SNOW COURSE	No.	Eleva	Survey	(in)	(in.)	1954	1953	Average	Record
THE TARKS DISTRICT									
WILLIAMS RIVER Iron Springs	12-R-2	6200	2/14	2.6	0.8	0.0	0.0	1.5	9
Camp Wood**	12-R-1	5700	2/15	5.2	1.1	0.0	0.0	1.0	9
Willow Ranch	13-R-1	5000	2/16	0.0	0.0	-	0.0	0.7	9
HILLOW REMOIL	10-1-1	0000	-, -0			_	0.0	0.1	J
LOWER COLORADO I	RIVER								
Bright Angel	12-N-1	8400	2/15	25.3	4.9	4.4	6.3	8.1	8
Grand Canyon	11-P-1	7500	2/15	10.8	2.9	1.5	0.4	2,8	8
Fort Valley	11 mP-2	7350	2/15	8.1	2.3	1.8	1.0	3.0	8
Chalender**	12-P-1	7100	2/15	16.4	4.4	2.6	1.1	3.5	8
TIMMIN GOLONADO	n Tiron								
LITTLE COLORADO	9-S-4	0500	2/15	6.1	1.7	0.2	0.3	2.2	15
Nutrioso	9-3-4 11-R-5	8500 7630	2/10	0.1	T • /		-	2.6	4
Happy Jack	10-R-5	7300	2/15	8.3	3.1	2.0	0.4	2.3	5
Gentry Heber	10-R-3	7 300	2/15	10.0	3.4	1.8	0.9	2.3	5
Canyon Creek	10-R-3	7300	2/15	12.0	3.9	2,2	0.9	3.1	5
Mormon Mountain		7500	2/16	16.6	5.0	3.8	2,9	4.5	5
Mormon Lake	11-R-4	7350	2/14	17.4	5 .3	3.0	1.5	5.7	8
Fort Valley	11-R-2	7350	2/15	8.1	2.3	1.8	1.0	3.0	8
McNary	9-R-2	7200	2/14	9.6	2.4	2.9	0.6	2.5	15
Forest Dale	10-R-6	6430	2/14	5.5	2.0	0.0	0.0	0.8	15
101000 2020	- 10 U	3	-,			- • •			



STATUS OF RESERVOIR STORAGE FEBRUARY 15, 1955

BASIN	USABLE Capacity		THO				
and STREAM	RESERVOIR Acr	ousand e Feet)	1955	1954	1953	1952	10-Year Averege 1943-52
Agua Fria	Iake Pleasant	178	23	33	62	119	16
Colorado	Lake Havasu	668	602	603	588	611	597
Colorado	Lake Mohave	1,810	1,706	1,664	1,574	1,593	-
Colorado	Lake Mead	27,935	12,063	16,441	18,800	17,006	16,325
Gila	San Carlos	1,285	37	0	6	152	138
Verde	Bartlett	180	59	42	32	176	40
Verde	Horseshoe	143	2	5	1	45	14
Salt	Roosevelt	1,382	494	586	1,027	494	404
Salt	Apache	245	231	244	235	136	19 A
Salt	Canyon	58	44	57	54	43	30
Salt	Saguaro	70	54	49	43	44	23,3
Little Colo.	Lyman	28,5	1.8	••	9.1	0	7.1



LIST OF SNOW SURVEYORS

SNOW COURSE	SURVEYOR
Baldy	. Wm. Hughes & J.R. Brinkley . Jess Eurke
Black Canyon	. Valentine & Buss
Camp Wood	
Casner Park	
Corner Mountain	. SCS
Forest Dale	. Olson
Frisco Divide	. SUS and SRVWU
Fort Valley	. Richard Enz
Gentry	. Dazey and Black
Happy Jack	. SCS and SRVWU
Inman	. Ernest Saxby
Maverick Fork	• Olson
Mingus Mountain	. J. R. Wray
Mormon Lake	. SCS and SRVWU
Munds Park	• Olson
N-Bar Lake	• SCS
Nutrioso	. Foch Phillips
Rose Canyon	. Kenneth Weissenborn
Taylor Creek	. L. W. Miller
Workman Creek	

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The following organizations cooperate in the Arizona snow survey work:

FEDERAL

Department of Agriculture

Forest Service
Apache Forest
Coconino Forest
Coronado Forest
Gila Forest
Kaibab Forest
Prescott Forest
Sitgreaves Forest
Southwestern Forest and Range Experiment
Station, Fort Valley, Arizona
Sierra Ancha Forest Experiment Station

Soil Conservation Service

Department of Commerce
Weather Bureau
Arizona Section

Department of Interior

Bureau of Reclamation Region III

Geological Survey
Arizona District

Bureau of Indian Affairs
Fort Apache Reservation

National Park Service Grand Canyon National Park

Gila Water Commissioner, Safford, Arizona

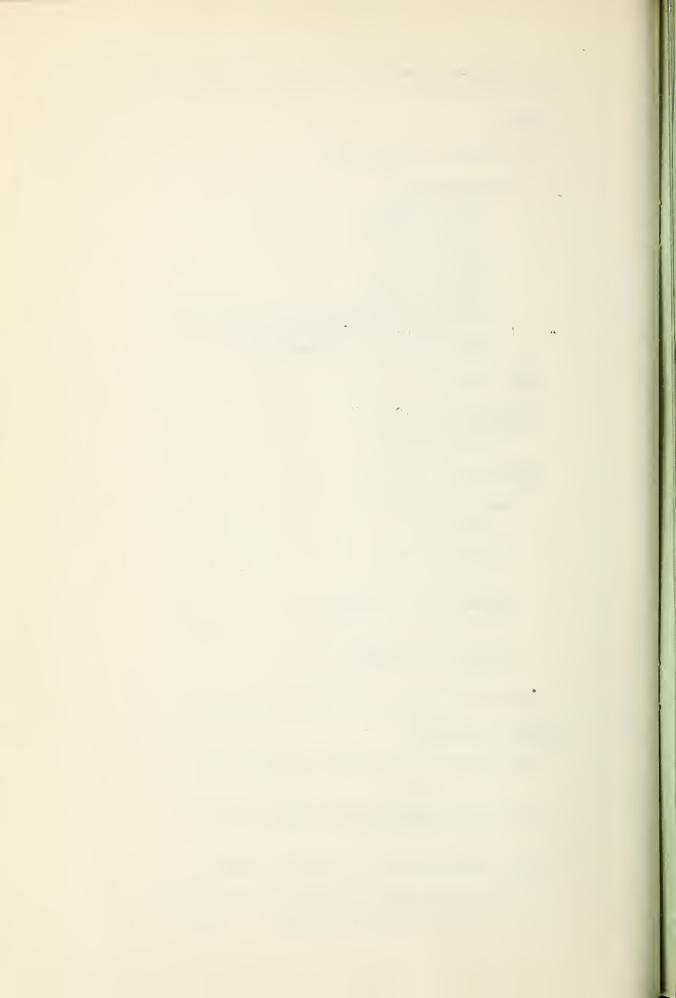
IRRIGATION PROJECTS

Salt River Vallay Water Users' Association, Phoenix, Arizona

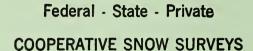
San Carlos Irrigation and Drainage District, Coolidge, Arizona

SOUTHWEST LUMBER MILLS, INC., McNary, Arizona

Other organizations and individuals furnish valuable information for the snow survey reports. Their co-operation is gratefully acknowledged.







Furnishes the basic data necessary for forecasting water supply for irrigation, domestic and municipal water supply, hydro-electric power generation, navigation, mining and industry

"WATER IS THE WEST'S GREATEST RESOURCE"